Spot Safety Project Evaluation

Project Log # 200512209

Spot Safety Project # 12-99-220

Spot Safety Project Evaluation of the Construction of a Concrete Island with a Dual Indicated Stop Signs on the Southbound approach of SR 1802 (Mt Olive Church Rd) and the Installation of Transverse Rumble Strips at Its Intersection with SR 1804 (Bethany Church Rd) Catawba County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 9/11/2007
Brad Robinson, EI Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-99-220 – SR 1802 (Mt Olive Church Rd) at SR 1804 (Bethany Church Rd) in Catawba County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location was the installation of a raised center island and dual indicated stop signs on the southbound approach of SR 1802 (Mt Olive Church Rd) at its intersection with SR 1804 (Bethany Church Rd). Transverse rumble strips were also installed on both approaches of SR 1802 to warn drivers of the stop condition. SR 1802 and SR 1804 are both two-lane facilities with no turn lanes at the subject intersection and speed limits of 45 mph. There are dual stop-ahead warning signs on both approaches of SR 1802. The subject location is a 4-leg intersection which is controlled by stop signs on SR 1802 (Mt Olive Church Rd).

The initial statement of problem was that there was a history of Rear-End Crashes at the intersection. There was also a fatal crash at the intersection, after which the dual-indicated stop condition was recommended upon investigation. The initial crash analysis was conducted from November 1, 1996 to October 30, 1999, which included 13 crashes. Six of these crashes were Rear-End Crashes and deemed correctable by the countermeasures.

The final completion date for the improvement at the subject intersection was on October 5, 2001 with a total cost of $20,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from September 1, 2001 through November 30, 2001. The before period consisted of reported crashes from April 1, 1996 through August 31, 2001 (5 years, 5 months) and the after period consisted of reported crashes from December 1, 2001 through April 30, 2007 (5 years, 5 months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The treatment data consisted of all crashes within 150 feet from the subject intersection. *Please see attached location map for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that the target crashes were broken into two categories. One category was Rear-End Crashes for vehicles approaching the intersection on SR 1802 (Mt Olive Church Rd). The second category was crashes involving a vehicle running the stop signs on SR 1802.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	23	4	-82.6
Total Severity Index	6.87	1	-85.4
Rear End Target Crashes	8	0	-100.0
Rear End Severity Index	3.77	N/A	N/A
Ran Stop Sign Target Crashes	4	0	-100.0
Ran Stop Sign Severity Index	23.65	N/A	N/A
Volume	7,400	7,300	-1.4
Crash Severity Summary			
Fatal Crashes	1	0	-100.0
Class A Crashes	0	0	N/A
Class B Crashes	4	0	-100.0
Class C Crashes	4	0	-100.0
PDO Crashes	14	4	-71.4

The naive before and after analysis at the treatment location resulted in an 83 percent decrease in Total Crashes, an 85 percent decrease in the Total Severity Index, and a 100 percent decrease in both types of Target Crashes. The before period ADT year was 1998 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 83 percent decrease in Total Crashes, a 100 percent decrease in Rear End Target Crashes, and a 100 percent decrease in Target Crashes involving the running of a stop sign. The total severity index decreased 85. The summary results above demonstrate that the treatment location appears to have had a decrease in Total Crashes and both types of Target Crashes from the before to the after period.

Referencing the *Collision Diagrams* and the previous table, it is apparent that the installation of the raised center island, dual-indicated stop signs, and transverse rumble strips helped to reduce both Rear-End Crashes and the running of the stop signs. The countermeasures also resulted in a high reduction in the Severity Index.

The installation of the traffic island helped to define the southbound SR 1802 approach lane for vehicles making right turns and those going straight or turning left. This might have contributed to the reduction in Rear-End Crashes on this approach.

In the before period, crash reports explicitly state that two of the southbound SR 1802 Frontal Impact Crashes involved a vehicle running the stop sign. These two crashes involved three "B" injuries and two "C" injuries. The crash report for the fatal crash does not explicitly state that the driver ran the stop sign, although it does indicate that the vehicle was traveling 30 mph at the time of the crash. The fatal crash also involved "B" and "C" class injuries. The fourth crash involving a vehicle running the stop sign was a northbound SR 1802 driver not recognizing the stop condition until it was too late, crossing the intersection and running off the roadway. In the after period there is no indication that any reported crashes involved a vehicle running the stop signs.

After a field investigation was conducted on September 20, 2006 it was noted that the southbound approach of SR 1802 no longer had transverse rumble strips. It appears that the roadway has been repaved, covering the rumble strips

The calculated benefit to cost ratio for this project is 38.33 considering total crashes. The benefit to cost ratio considering only target crashes is 34.44. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1804 at SR 1802 BY: Brad Robinson
COUNTY: Catawba DATE: 2/22/2007
FILE NO.: SS 12-99-220

DETAILED COST: TYPE IMPROVEMENT - Shoulder Guardrail

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$20,000	8	0.174	$3,480
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$20,000	8	0.174	$3,480

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $0
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $3,480
TOTAL COST OF PROJECT= $20,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.42	1	0.18	8	1.48	14	2.58	$136,421
AFTER	5.42	0	0.00	0	0.00	4	0.74	$3,026

Annual Benefits from Crash Cost Savings $133,395

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $129,915

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 38.33

TOTAL COST OF PROJECT - $20,000 COMPREHENSIVE B/C RATIO - 38.33

BENEFIT-COST ANALYSIS WORKSHEET TARGET

LOCATION: SR 1804 at SR 1802 BY: Brad Robinson
COUNTY: Catawba DATE: 2/22/2007
FILE NO.: SS 12-99-220

DETAILED COST: TYPE IMPROVEMENT - Shoulder Guardrail

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$20,000	8	0.174	$3,480
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$20,000	8	0.174	$3,480

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $0
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $3,480
TOTAL COST OF PROJECT= $20,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.42	1	0.18	5	0.92	6	1.11	$119,852
AFTER	5.42	0	0.00	0	0.00	0	0.00	$0

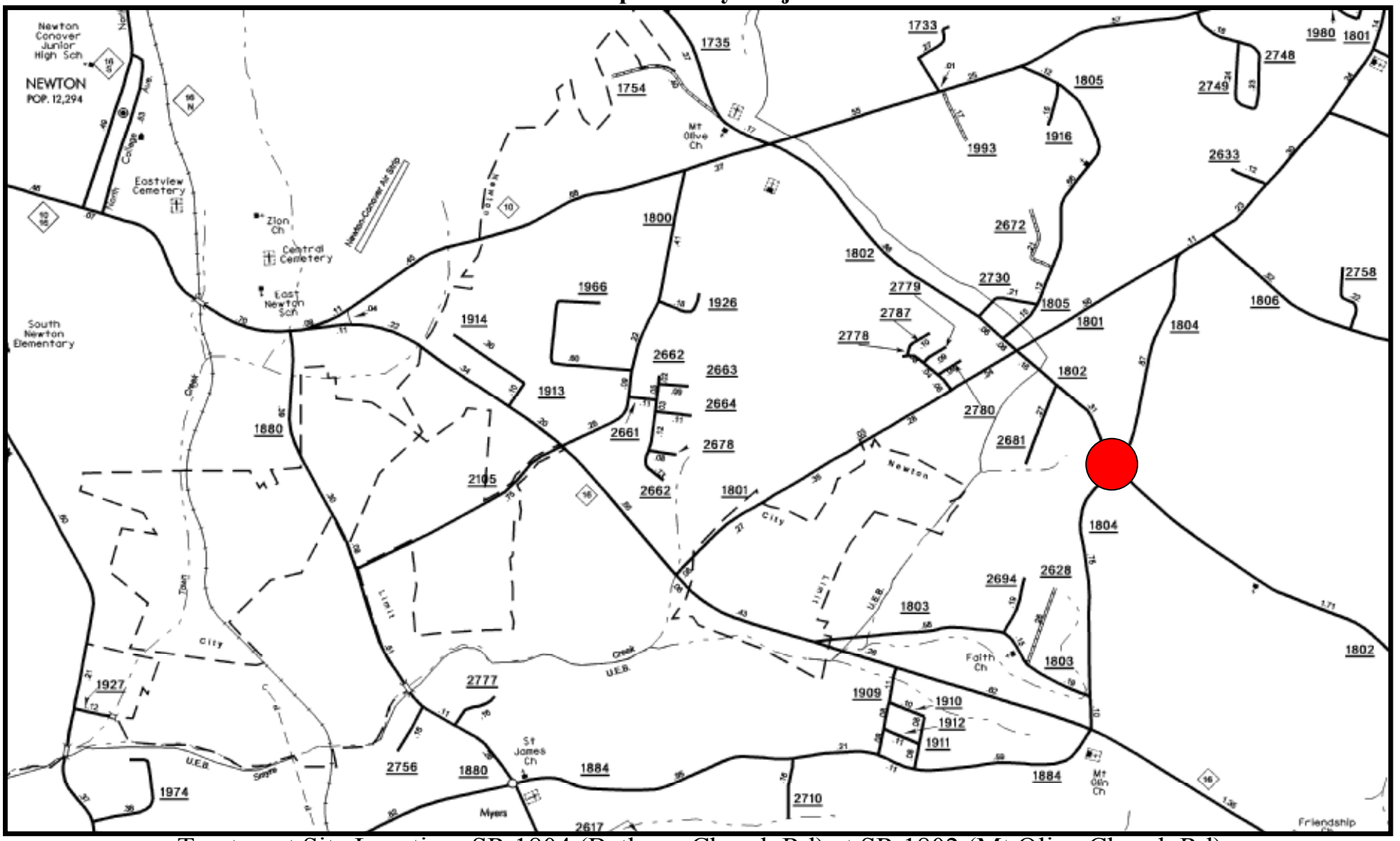
Annual Benefits from Crash Cost Savings $119,852

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $116,372

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 34.44

TOTAL COST OF PROJECT - $20,000 COMPREHENSIVE B/C RATIO - 34.44

Location Map
Catawba County
Evaluation of Spot Safety Project #12-99-220



Treatment Site Location: SR 1804 (Bethany Church Rd) at SR 1802 (Mt Olive Church Rd)

Treatment Site Photos Taken September 20, 2006

Traveling Southeast on SR 1802 (Mt Olive Church Rd)

Traveling Southeast on SR 1802 (Mt Olive Church Rd)

Traveling Southeast on SR 1802 (Mt Olive Church Rd)

Traveling Northwest on SR 1802 (Mt Olive Church Rd)

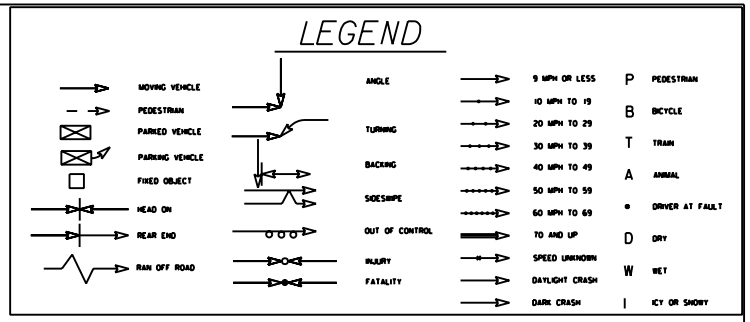
Traveling Northwest on SR 1802 (Mt Olive Church Rd)

Rumble Strips on Northwest SR 1802 (Mt Olive Church Rd)

Looking Northeast on SR 1804 (Bethany Church Rd)

Looking Southwest on SR 1804 (Bethany Church Rd)

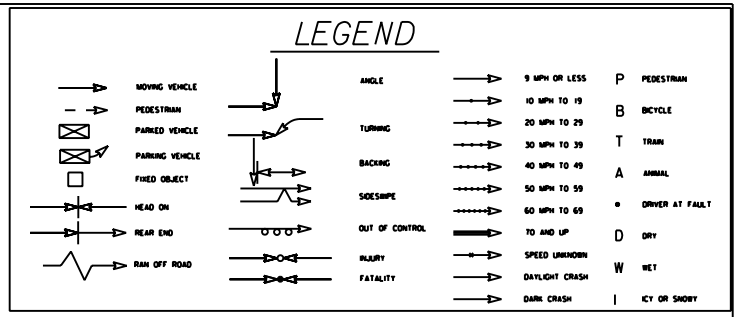
Catawba County
SR 1804 (Bethany Church Rd
at SR 1802 (Mt Olive Church Rd)
Treatment Site in the Before Period
From 4/1/1996-8/31/2001

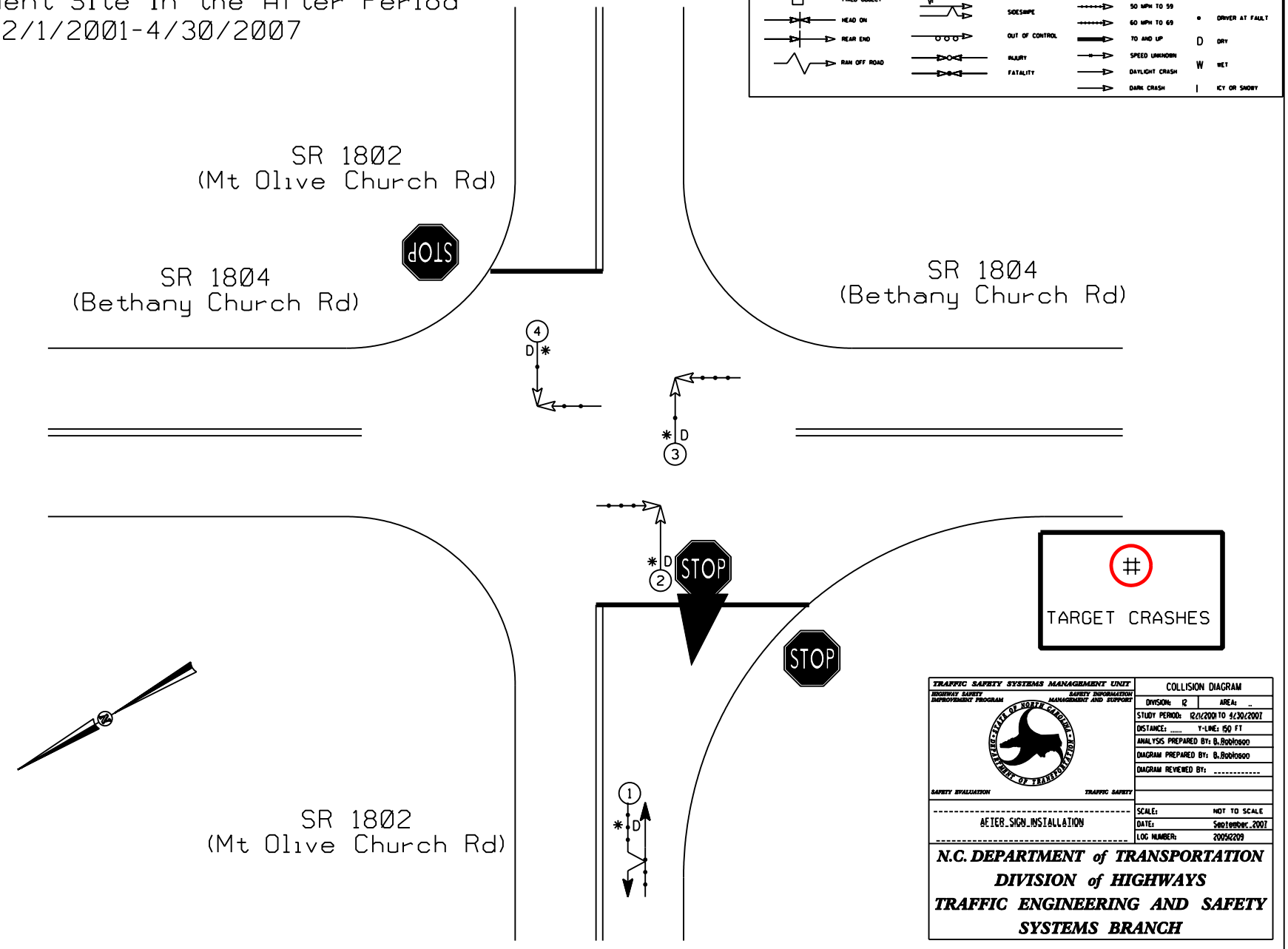


TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT	COLLISION DIAGRAM
HIGHWAY SAFETY IMPROVEMENT PROGRAM / SAFETY INFORMATION MANAGEMENT AND SUPPORT	DIVISION: 12 AREA: ..
	STUDY PERIOD: 4/1/1996 TO 8/31/2001
	DISTANCE: ..... Y-LINE: 150 FT
	ANALYSIS PREPARED BY: B.Robinson
	DIAGRAM PREPARED BY: B.Robinson
	DIAGRAM REVIEWED BY: ----------
SAFETY EVALUATION / TRAFFIC SAFETY	
BEFORE SIGN INSTALLATION	SCALE: NOT TO SCALE
	DATE: September 2007
	LOG NUMBER: 20052209

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

Catawba County
SR 1804 (Bethany Church Rd
at SR 1802 (Mt Olive Church Rd)
Treatment Site in the After Period
From 12/1/2001-4/30/2007





TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION
TRAFFIC SAFETY

AEIER_SIGN_INSTALLATION

COLLISION DIAGRAM

DIVISION: 12	AREA: ..
STUDY PERIOD: 12/1/2001 TO 4/30/2007	
DISTANCE:	Y-LINE: 150 FT
ANALYSIS PREPARED BY: B.Robinson	
DIAGRAM PREPARED BY: B.Robinson	
DIAGRAM REVIEWED BY: ----------	
SCALE:	NOT TO SCALE
DATE:	September, 2007
LOG NUMBER:	20052209

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DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH